Risk assessment

963235

A hybrid recurrence model and its implication on seismic hazard results

Shen-Chyun Wu, C. A. Cornell & S. R. Winterstein, *Bulletin - Seismological Society of America*, 85(1), 1995, pp 1-16.

To account for the effects of the characteristic earthquakes on an individual fault (segment), a renewal hybrid model is proposed for seismic hazard analysis and studied in depth. This model incorporates a renewal-time, characteristic-magnitude model for larger earthquakes with the conventional exponential-time, exponential-magnitude model for smaller earthquakes. Properties of important temporal and magnitude parameters are studied. The exact and the approximate ('first-event') hazards estimated by this model are discussed. The approximate results are found sufficiently accurate for most engineering applications. (from Authors)

ANALYSIS TECHNIQUES

Stress analysis

963236

Application of boundary element method to determination of stresses and displacements in rock mass at room-pillar mining

R. Grzaslewicz & D. Lydzba, *Studia geotechnica et Mechanica*, 16(1-2), 1994, pp 43-52.

It was assumed that a vertical cross-section of the exploitation head consists of pillars under uniaxial compression and a thick roof plate under shear stresses. In addition, the rock mass is regarded to be an elastic linear material with infinitesimal state of strains with small displacements. (from Authors)

963237

The quantitative research on the palaeotectonic stress field and its control to coal and gas outburst (in Chinese)

Xu Fengyin, Xhu Xingshan, Wang Guiliang & Ma Xingyuan, *Scientia Geologica Sinica*, 30(1), 1995, pp 71-84.

The palaeotectonic stress field is the main factor to control coal and gas outbursts in the Furong mining area. Using the methods of finite stress analysis of vitrinite reflectance, Etchecopar computer calculation, analysis of conjugate shear stress and numerical simulation, the palaeotectonic stress field was quantitatively studied. The results indicate that the structures were respectively formed by the stress field with the direction of 190° <23° and 145° <29°, with strength of 21MPa and 23MPa. These made the structures on different scales stack in the direction of EW and NE. The results provide the theoretical basis for the prediction of coal and gas outburst. (from English summary)

Modelling and numerical methods

963238

Knowledge-based systems in geotechnical engineering

M. Moula, D. G. Toll & N. Vaptismas, *Geotechnique*, 45(2), 1995, pp 209-221.

Reviews knowledge-based systems which have been developed for geotechnical applications and the geotechnical aspects of the systems are described. Systems have been developed for, among other topics, site characterization, foundations, earth-retaining structures, slope stability, tunnels, groundwater problems and ground improvement. An assessment has been made of the stage of the development of each system (where possible) and also the source of the knowledge incorporated in the systems. (Authors)

963239

Computer graphics smooth the way

D. Schofield, B. Denby, D. McClamon & M. Jones, *Mine & Quarry*, 24(8), 1995, pp 32-36.

Discusses the development of a complete 3D computer model of a 50ha quarry site at Tiln south, Nottinghamshire, UK. The model was developed to the stage where individual object textures, lighting conditions and movement could be considered in the views selected. Using the model the developers were able to assure residents that the visual impact of the extraction would be limited and the mitigating measures proposed, such as tree screening, tree planting and hedge planting, would reduce the effect. Model development and the methods used to complete the project are described. (C.Paice)

963240

An arch dam design system with artificial intelligence (in Chinese)

Sun Yangbiao, Lou Changqing, Xu Yeping & Wang Baisheng, *Shuili Xuebao/Journal of Hydraulic Engineering*, 7, 1995, pp 79-83.

This paper describes a computer software system for arch dam design. The system is able to analyze dam stresses, abutment stability and to optimize eight types of arch dams. The system includes a knowledge base. A multiobjective fuzzy decision making method is applied to select a satisfactory scheme. (from English summary)

963241

Earthquake-resistant design features of immersed tunnels in Japan

O. Kiyomiya, *Tunnelling & Underground Space Technology*, 10(4), 1995, pp 463-475.

Many immersed tunnels have been constructed in soft ground at port areas, where the response of both the soft ground and the immersed tunnels are amplified during earthquakes. To estimate sectional force due to earthquake load, design methods have been developed by experimental testing, field observations and computer analysis. This paper outlines seismic design methods and countermeasures to earthquakes in Japan. (Author)

963242

Discrete and continuum approaches to simulate the thermo-hydro-mechanical couplings in a large, fractured rock mass

A. Millard & 12 others, *International Journal of Rock Mechanics & Mining Sciences*, 32(5), 1995, pp 409-434.

There exist two possible approaches to model a highly fractured rock mass: either represent each fracture individually or use an equivalent continuum. These two approaches have been compared in the frame of a bench mark test (BMT1). The thermal and mechanical results compare well, while hydraulic results show pronounced differences which can be partly attributed to the non-linear dependance of the fracture hydraulic conductivity. (from Authors)

963243

The fully-coupled model for rock engineering systems

Y. Jiao & J. A. Hudson, *International Journal of Rock Mechanics & Mining Sciences*, 32(5), 1995, pp 491-512.

This paper introduces the fully-coupled model (FCM). The model is developed from rock engineering systems (RES) concepts and graph theory, and has been developed initially with linear mechanisms. Five numerical examples of the linear FCM are given: simultaneous equations, spring structures, a pressurized thick cylinder, a six-variable dam system and a nine-variable pressure tunnel system. It is demonstrated that the outputs resulting from any input perturbations can be rapidly assessed with the FCM. (from Authors)

963244

Prospects for universal geothermal energy from heat mining

J. W. Tester, H. J. Herzog, Z. Chen, R. M. Potter & M. G. Frank, *Science & Global Security*, 5(1), 1994, pp 99-121.

A generalized multi-parameter economic model was developed for optimizing the design and performance of hot dry rock (HDR) geothermal systems. Key technical and institutional obstacles to universal heat mining are discussed in a more general context. Advanced concepts in drilling technology are reviewed in light of their potential impact on overcoming some of these obstacles to universal heat mining. (from Authors)

963245

Modelling of a European prototype HDR reservoir

A. J. Jupe & 11 others, *Geothermics*, 24(3), 1995, pp 403-419.

This paper provides an intorduction to the collaborative reservoir modelling studies undertaken as part of the European Programme. In particular the paper addresses the general methodology adopted in the reservoir design process and focuses on one of the preliminary objectives of the study, assessment of the minimum HDR doublet separation required to meet the thermal performance objectives during circulation. (from Authors)

963246

Assessment of HDR reservoir stimulation and performance using simple stochastic models

J. Willis-Richards, *Geothermics*, 24(3), 1995, pp 385-402.

Two simple models, based on standard analytic solutions for the mechanical behaviour of cracks combined with a simple representation of the frictional properties of fracture surfaces, have been developed. The models describe the stimulation and circulation of HDR reservoirs in naturally fractured basement. The models provide estimates of the rock volume to fluid volume ratios required for stimulations, the injection flow rate for differing injection pressures, and fluid flux/fracture area partitioning, and hence thermal drawdown behaviour. (from Author)

963247

Coupled hydraulic, thermal and mechanical considerations for the simulation of hot dry rock reservoirs

T. Kohl, K. F. Evans, R. J. Hopkirk & L. Rybach, *Geothermics*, 24(3), 1995, pp 345-359.

The coupled hydro-thermo-mechanical response of a fractured media to forced fluid flow in a simple Hot-Dry-Rock system is investigated. The geometry, a single fracture in a 2D matrix, was chosen in order to better understand the relevant processes for the long term behaviour of HDR reservoir. Linear elastic effects of temperature and pore pressure perturbations on stress in the solid matrix are assumed as well as a non-linear joint closure law. Thermal transport by both conduction and advection is included in the fracture and the matrix. The results of these models highlight the importance of the coupled hydraulic thermal and mechanical processes on long term system behaviour. (Authors)

963248

Modelling flow and heat transfer in fractured rocks: conceptual model of a 3-D deterministic fracture network

O. Kolditz, *Geothermics*, 24(3), 1995, pp 451-470.

The proposed model is based on the general idea, that flow and advective transport in stimulated HDR reservoirs occur mainly in fractures, whose orientation is linked by the tectonic stress field. Therefore, a deterministic fracture network model is established which represents the mean geometrical features of a stimulated HDR system. A physical and mathematical model of a fractured porous medium is developed for describing flow and transport within the interacting system of fractures and rock matrix. The model is then translated into a discrete finite-element approach. (Author)

963249

Modelling flow and heat transfer in fractured rocks: dimensional effect of matrix heat diffusion

O. Kolditz, *Geothermics*, 24(3), 1995, pp 421-437.

Numerical methods allow fully 3-D modelling which reflects the natural situation of spatial heat propagation in rock formations. The numerical model is verified against analytical solutions at the 2.5-D level. (from Author)

ROCK BREAKAGE AND EXCAVATION

General

963250

Estimation of rippability and excavation conditions from seismic velocity measurements

D. M. McCann & P. J. Fenning, in: *Engineering geology of construction,* ed M. Eddleston & others, (Geological Society of London; Engineering Geology Special Publication, 10), 1995, pp 335-343.

From a knowledge of the seismic velocity it is possible to establish where blasting may be required along the route rather than conventional excavation procedures. The popular term 'ripping' is applied to excavation without blasting and manufacturers of excavation equipment have produced charts relating the rippability of a rock mass to its measured *in situ* seismic velocity. The effectiveness of the use of seismic velocity measurements for predicting rippability is examined. It is shown that, provided each lithological type is considered, in conjunction with an assessment of the degree of fracturing and weathering in the rock mass and an appraisal of the effects of stress relief, then seismic velocity is a valuable parameter for predicting rippability. (from Authors)

Drilling

963251

Large-diameter shaft drilling: a versatile tool for advanced mining

D. R. Zeni, *Mining Engineering*, 47(9), 1995, pp 847-849.

The author traces the history of the equipment and methods employed by the large-diameter shaft-drilling industry and explores the likely paths of future development. Case histories that illustrate the adaptability of shaft drilling as a versatile tool for advanced, worldwide mining operations are cited. Safety, scheduling, costs, environmental impacts and capabilitiees are discussed. (from Author)

963252

Underbalanced drilling with air offers many pluses

L. Shale, *Oil & Gas Journal*, 93(26), 1995, pp 33-39.

The use of air drilling techniques offers several advantages over drilling with conventional mud systems. In comparison with mud drilling, rates of penetration are significantly increased, resulting in less drilling time and fewer bits used. Some well bore problems, such as sloughing of sensitive shales are virtually eliminated. This article describes the use of underbalanced drilling which usually takes place when the reservoir pressure have dropped substantially to levels below the hydrostatic pressure that is exerted by conventional water-based drilling fluids. The equipment required, methods employed and circumstances of use are discussed. (C.Paice)

963253

Special techniques and equipment reduce problems

R. A. Joseph, *Oil & Gas Journal*, 93(13), 1995, pp 41-47.

This conclusion of a two part article on underbalanced horizontal drilling describes special techniques and equipment used in drilling high-temperature abnormally pressured Austin Chalk wells in Louisiana. Techniques used included downhole-adjustable equipment, measurement-while drilling with real time resistivity, and low gel strength mud which cleaned easily from fractures and helped reduce formation damage. The drilling and completion operations are described